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(54) Title: **SYNTHETIC GENE ENCODING RHESUS MONKEY CARCINOEMBRYONIC ANTIGEN AND USES THEREOF**

Rhesus Monkey CEA Codon-Optimized Nucleotide Sequence

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1  ATGGGACGCC CCAGCGCCCC CCTGCACCGC TGGTGCATCC CTTGGCAGAC
   CCTGCTGCTG ACCGCCAGCC TGCTGACCTT CTGGAACCCC CCCACCACCG
101  CCCAGCTGAC CATCGAGAGC CGCCCTTCA AGTGGGCGA GGGCAAGGAG
   GTGCTGCTGC TGGCCACAAA CBTGAGCCAG AACCTGTTGG GCTACATCTG
201  GTACAGGGGC GAGCGCGTGG ACGCCAGCCG CGCATCGCG AGCTGCGTGA
   TCCGCACCCA GCGAGTACCC CCGGGCCCGG CCCACAGCGG CCGCGAGACC
301  ATCGACTTCA ACGCCAGCCT GCTGATCCAC AACGTGACCC AGAGCGACAC
   CGGCAGCTAC ACCATCCAGG TGATCAAGGA GGACCTGGTG AACGAGGAGG
401  CCACCGGCCA GTTCCGCGTG TACCCGAGC TGCCCAAGCC CTACATCAGC
   AGCAACAACA GCAACCCCGT GGAGGACAAG GACGCCGTGG CCTGACCTG
501  CGAGCCGAGG ACCCAGGACA CCACCTACCT GTGGTGGGTG AACAAACAGA
   GCCTGCCTGT GAGCCCCCGC CTGGAGCTGA GCAGCGACAA CCGCACCTGT
601  ACCGTGTTCA ACATCCCGCG CAAGGACACC ACCAGCTACA AGTGGGAGAC
   CCAGAACCCC GTGAGCGTGC GCCGACGCGA CCCCCTGACC CTGAACGTGC
701  TGTACGGCCC CGACGCCCCC ACCATCAGCC CCTTGAACAC CCCCTACCGC
   GCGCGCAGAA ACCTGAACCT GACCTGCCAC GCCGCCAGCA ACCCCACCGC
801  CCAGTACTTC TGGTTCTGTA ACGGACCTTT CCAGCAGAGC ACCCAGGAGC
   TGTTCATCCC CAACATCACC GTGAACAACA GCGGCAGCTA CATGTGCCAG
901  GCCCAACAAC GCGCCACCGG CCTGAACCGC ACCACCGTGA CCGCCATCAC
   CGTGTACGCC GAGCTGCCCA AGCCCTACAT CACCAGCAAC AACAGCAACC
1001  CCATCGAGGA CAAGGACGCC GTGACCTGTA CTGCGAGCG CGAGACCCAG
   GACACCACCT ACCTGTGGTG GGTGAACAAC CAGAGCCTGA GCGTGACGAG
1101  CCGCCTGGAG CTGAGCAAGC ACAACCGCAC CTTGACCGTG TTCAACATCC
   CCGCAACAGA CACCACCTTC TACGAGTGGG AGACCCAGAA CCCCCTGAGC
1201  GTGCGCGGCA GCGACCCCGT GACCTGAAC GTGCTGTACG GCGCCGACGC
   CCCACCATC AGCCCCCTGA ACACCCCTTA CCGCGCCGGC GAGAACCTGA
1301  ACCTGAGCTG CCACGCCGCG AGCAACCCCG CCGCCCAAGT CAGCTGGTTC
   GTGAACGGCA CCTTCCAGCA GAGCACCCAG GAGCTGTCTA TCCCAACAT
1401  CACCGTGAAC AACAGCGGCA GCTACATGTG CCAGGCCAC CAGAGCGCCA
   CCGGCTGAA CCGCACCACC GTGACCGCCA TCACCGTGTG CBTGAGCTG
1501  CCCAAGCCCT ACATCAGCAG CAACAACAGC AACCCATCG AGSACAAGGA
   CGCGTGACCC CTGACCTCGG AGCCCGTGGC CGAGAACACC ACCTACCTGT
1601  GGTGGGTGAA CAACAGAGGC CTGAGCGTGA GCGCCGCTCT GCAGCTGAGC
   AACGGCAACC GCATCCTGAC CTTGCTGAGC GTGACCCGCA ACGACACCGG
1701  CCCTACGAGG TCGGCGATCC AGAACAGCGA GAGCGCCAG CCGAGCGACC
   CCGTGACCTT GAACGTGACC TACGGCCCGG ACACCCCAT CATCAGCCCC
1801  CCGACCTGA GCTACCGCAG CCGCGCCAAC CTGAACCTGA GCTGCCACAG
   CGACAGCAAC CCCAGCCCCC AGTACAGCTG GCTGATCAAC GGCACCTGCG
1901  GCCAGCACAC CCAAGTGTCTG TTATCAGCA AGATCACAGC CAACAACAGC
   GCGCCTACGC CTTGCTTCGT GAGCAACCTG GCCACCGGCC GCAACAACAG
2001  CATCGTGAAG AACATCAGCG TGAGCAGCGG CGACAGCGCC CCGGCGAGCA
   GCGGCTGAGG CGCCCGCGCC ACCGTGGGCA TCATCATCGG CATGCTGGTG
2101  GCGCTGGGCC TGATGTGA (SEQ ID NO:1)

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(57) Abstract: Synthetic polynucleotides encoding rhesus monkey carcinoembryonic antigen (CEA) are provided, the synthetic polynucleotides being codon-optimized for expression in a human cellular environment. The gene encoding CEA is commonly associated with the development of human carcinomas. The present invention provides compositions and methods to elicit or enhance immunity to the protein product expressed by the CEA tumor-associated antigen, wherein aberrant CEA expression is associated with a carcinoma or its development. This invention specifically provides adenoviral vector and plasmid constructs carrying codon-optimized rhesus monkey CEA and discloses their use in vaccines and pharmaceutical compositions for preventing and treating cancer.

WO 2005/019455 A1



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